

same as that described by Mott as a distinct part of the antero-lateral tract of Gowers, and is certainly no artifact, as has been suggested by Patrick.

“On the Orientation of Greek Temples and the Dates of their Foundation derived from Astronomical Considerations, being a Supplement to a Paper published in the ‘Transactions of the Royal Society,’ in 1893.” By F. C. PENROSE, F.R.S. Received February 24,—Read March 11, 1897.

(Abstract.)

The paper first states briefly the link which connects this branch of archaeology with astronomy, namely thus :—The great temple functions were celebrated at early dawn, the principal annual function being on the day when the sun, rising above the visible horizon, shone along the axis of the temple, through the eastern door, upon the Statue of the Deity in the sanctuary, the axis of the temple having been so directed at its foundation—an institution which seems to have originated in Egypt, but which was, from the earliest times, adopted in Greece. But as some time was required by the priests for preparation for the ceremony, in the absence of clocks, the rising or setting of an heliacal star would have to be observed from the sanctuary to give warning of the sun’s approach ; and it would be the case, roughly, that when such star could be just seen either at its appearing in the east, or just before its disappearance in the west, it would give about an hour’s time for preparation. The data for the calculation are : the latitude, the amplitude given by the direction of the temple’s axis and the altitude of the visible horizon. From these the sun’s right ascension and declination are deduced, then the place of a star having been found suitable for acting as a warning star—which could not have been always possible without original contrivance—the precessional movement of such star will then give the period which has elapsed since it was in accurate heliacal correspondence with the sun.

In the paper are recorded some observations of the heliacal visibility of stars chiefly before sunrise, and the different angles of solar depression which seem to me to be required for stars of different magnitudes, and particularly as to the visibility of the Pleiades in twilight.

Then the elements of orientation of a number of temples are given, viz., four from Athens, which were not included in the former series, a new determination of the ancient Heræum near Argos, the former having been taken before the site was completely cleared ; of the temple of Apollo at Delphi, of which the site is very

peculiar; but the temple is shown to have apparently followed the general rule, and that when rebuilt about three hundred years after the first foundation, the orientation was corrected so as to follow the precessional movement of the star.

In the examples of Greek remains in Calabria, of which six examples are given, are two cases of orientation to the winter solstice, and an instance is afterwards given from Pompeii (originally a Greek city) of orientation to the summer solstice—of these extremes I have found no examples in Greece itself. One of the examples of the winter solstice, from the ancient city of the Locri, is remarkable as being taken from foundations lying underneath those of a later temple with very different orientation and a different heliacal star. The winter solstice temples were warned by the setting, and the summer solstice temple by the rising, of the same star, β Geminorum.

The dates of the earliest of the Italian temples follow, at an interval of nearly nine hundred years, that of the foundation of the earliest of those in Greece. The temples in Sicily are rather later still, which would be the natural development, and are also in remarkable accordance with what is known by historical tradition of the Greek civilization of the island.

From Thucydides B. VI are derived the dates at which Hellenic colonies founded, or occupied, the following cities:—

Syracuse	B.C. 734
Selinus	629
Agrigentum.....	582

And it may be inferred from the same authority that the foundation of Segeste preceded the above given dates.

The orientation dates which I have derived for temples in these cities are—

Segeste.....	B.C. 830
Syracuse	{ 815
	{ 695
	{ 450
Selinus.....	{ 870
	{ 610
	{ 550

There are also at Selinus four other temples, of which I only obtained approximate orientations, sufficient, however, to show me that their dates would not be anterior to the seventh century B.C.

Agrigentum.....	{ B.C. 820
	{ 470
	{ 450
	{ 430
	{ 400

It is known from Diodorus that the great temple-building period at Agrigentum commenced after 480 B.C., and further, the temple the fourth on the list was incomplete as respects its roof in 406, and was never finished afterwards. It was a huge temple, and the orientation date for the foundation has great architectural probability. After a shock to its prosperity in 406, the city partially recovered, and six years afterwards may have been able to found the small temple with which I have closed the above list. Also the orientation date of the temple at Paestum coincides exactly with a passage in Herodotus in which, although he does not mention the temple, he speaks of the celebrity of a Posidonian architect.

“A Study of the Phenomena and Causation of Heat-contraction of Skeletal Muscle.” By T. G. BRODIE, M.D., and S. W. F. RICHARDSON, M.B., B.S. Communicated by W. D. HALLIBURTON, F.R.S. Received March 2,—Read March 11, 1897.

(From the Physiological Laboratory of St. Thomas' Hospital.)

(Abstract.)

In carrying out some experiments to determine the changes in length of a muscle when subjected to varying loads and temperatures, we have paid particular attention to those changes produced from the onset of heat-contraction up to a higher temperature. We have, for the particular study of these changes, always employed a sartorius preparation of a frog immersed in diluted defibrinated blood, which was gradually heated in a water bath. The changes in length were recorded photographically. The necessary tension was applied by means of a very weak spiral spring.

If the load be low—we have usually employed one below 1 gram—the record shows four separate contractions. These are:—

- (1) A contraction commencing at about 32° C., and ceasing at about 40° C.
- (2) A second commencing at about 46° C., and ceasing soon after 50° C.
- (3) A third commencing at about 56° C., and ceasing soon after 60° C.
- (4) A fourth commencing at about 63° C., and extending up to 75° C.

If we contrast the temperatures of these contractions with those given as the points of coagulation of the proteids of frog's muscle plasma by v. Fürth, we find that the first three agree in all points